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BUREAU OF MINES MINERALS YEARBOOK

The Mineral Industry of North Dakota

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This publication is a chapter from the current Bureau of Mines Minerals Yearbook, comprising *Volume I, Metals and Minerals; Volume II, Area Reports: Domestic; Volume III, Area Reports: International.* The separate volumes of the Yearbook are sold by the Superintendent of Documents, Washington, D.C. 20402.

The Mineral Industry of North Dakota

This chapter has been prepared under a Memorandum of Understanding between the Bureau of Mines, U.S. Department of the Interior, and the North Dakota Geological Survey for collecting information on all nonfuel minerals.

By James H. Aase[1] and David W. Brekke[2]

The value of nonfuel mineral production in North Dakota during 1984 was $21.8 million, a 14% decrease from the record high set in 1983, but 14% above the 10-year average. The decrease was attributed principally to a lower unit price for construction sand and gravel. Construction sand and gravel was the State's leading nonfuel mineral commodity in value, constituting 52% of the total output value in 1984. Other nonfuel mineral commodities produced, in descending order of production value, included lime, salt, clays, and peat, all registering gains in either quantity or value over 1983 figures.

North Dakota, in 1984, was 48th among all the States for nonfuel mineral production value, accounting for less than 1% of the U.S. total. Nationally, the quantity of salt produced in the State during 1984 was ranked 12th among 16 producing States; peat, 22d of 22; lime, 30th of 38; construction sand and gravel, 37th of 50; and clays, 41st of 44.

Table 1.—Nonfuel mineral production in North Dakota[1]

Mineral	1983		1984	
	Quantity	Value (thousands)	Quantity	Value (thousands)
Gem stones	NA	$2	NA	$2
Lime thousand short tons	57	6,798	60	5,912
Sand and gravel (construction) do.	e3,800	e15,000	6,426	11,351
Combined value of clays, peat, and salt	XX	3,570	XX	4,529
Total	XX	25,370	XX	21,794

eEstimated. NA Not available. XX Not applicable.
[1]Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

Table 2.—Value of nonfuel mineral production in North Dakota, by county[1]

(Thousands)

County	1982	1983	Minerals produced in 1983 in order of value
Barnes	$78	(2)	
Bottineau	W	W	Peat.
Bowman	W	W	Salt.
Burke	W	(2)	
Burleigh	525	(2)	
Cass	W	(2)	
Dickey	41	(2)	
Divide	42	(2)	
Eddy	W	(2)	
Kidder	36	(2)	
McHenry	W	(2)	
McKenzie	350	(2)	
McLean	218	(2)	
Morton	W	W	Clays.
Mountrail	300	(2)	
Pembina	W	W	Lime.
Pierce	W	(2)	
Richland	W	W	Lime.
Rolette	67	(2)	
Stark	W	(2)	
Stutsman	548	(2)	
Towner	W	(2)	
Traill	W	W	Lime.
Walsh	114	(2)	
Ward	W	(2)	
Wells	W	(2)	
Williams	W	W	Salt.
Undistributed[3]	10,658	$10,370	
Sand and gravel (construction)	XX	e15,000	
Total	12,977	25,370	

eEstimated. W Withheld to avoid disclosing company proprietary data; included with "Undistributed." XX Not applicable.

[1]No production of nonfuel mineral commodities was reported for counties not listed.

[2]Construction sand and gravel was produced; data were not available by county. Total State values are shown separately under "Sand and gravel (construction)."

[3]Includes gem stones and some sand and gravel (construction, 1982) that cannot be assigned to specific counties and values indicated by symbol W.

Table 3.—Indicators of North Dakota business activity

		1982r	1983	1984p
Employment and labor force, annual average:				
Population	thousands	672	681	686
Total civilian labor force	do.	316.0	319.0	327.0
Unemployment	do.	18.0	18.0	17.0
Employment (nonagricultural):				
Mining total	do.	9.4	7.0	7.4
Nonmetallic minerals except fuels[1]	do.	.3	.4	.4
Coal mining	do.	1.2	1.2	1.3
Oil and gas extraction	do.	7.9	5.4	5.7
Manufacturing total	do.	14.9	14.8	15.5
Stone, clay, and glass products	do.	.8	.8	.8
Chemicals and allied products[2]	do.	.1	.1	NA
Petroleum and coal products[2]	do.	.4	.4	NA
Construction	do.	15.7	17.5	14.1
Transportation and public utilities	do.	16.8	16.1	16.4
Wholesale and retail trade	do.	66.6	66.1	67.7
Finance, insurance, real estate	do.	11.8	12.0	12.2
Services	do.	54.2	56.0	57.5
Government and government enterprises	do.	60.3	61.3	61.9
Total	do.	249.7	[3]250.6	252.7
Personal income:				
Total	millions	$7,394	$7,944	$8,479
Per capita		$11,008	$11,667	$12,352
Hours and earnings:				
Total average weekly hours, production workers		37.6	38.0	38.4
Total average hourly earnings, production workers		$7.50	$7.73	$7.86

See footnotes at end of table.

Table 3.—Indicators of North Dakota business activity —Continued

		1982[r]	1983	1984[p]
Earnings by industry:				
Farm income	millions	$517	$769	$838
Nonfarm	do.	$4,583	$4,829	$5,065
Mining total	do.	$331	$225	$257
Nonmetallic minerals except fuels	do.	$7	$8	$9
Coal mining	do.	$46	$50	$56
Oil and gas extraction	do.	$279	$167	$191
Manufacturing total	do.	$300	$313	$343
Primary metal industries	do.	(4)	(4)	(4)
Stone, clay, and glass products	do.	$17	$18	$18
Chemicals and allied products	do.	$3	$3	$3
Petroleum and coal products	do.	$16	$16	$18
Construction	do.	$415	$517	$422
Transportation and public utilities	do.	$474	$506	$541
Wholesale and retail trade	do.	$964	$981	$1,041
Finance, insurance, real estate	do.	$223	$245	$266
Services	do.	$892	$997	$1,094
Government and government enterprises	do.	$964	$1,024	$1,000
Construction activity:				
Number of private and public residential units authorized		2,805	4,392	3,046
Value of nonresidential construction	millions	$95.7	$102.4	$99.1
Value of State road contract awards	do.	$78.7	$102.8	$119.6
Shipments of portland and masonry cement to and within the State	thousand short tons	272	323	352
Nonfuel mineral production value:				
Total crude mineral value	millions	$13.0	$25.4	$21.8
Value per capita		$19	$37	$32

[p]Preliminary. [r]Revised. NA Not available.
[1]Job Service North Dakota.
[2]Bureau of Economic Analysis, Regional Economic Measurement Division, U.S. Department of Commerce.
[3]Data do not add to total shown because of independent rounding.
[4]Less than 1/2 unit.

Sources: U.S. Department of Commerce, U.S. Department of Labor, Highway and Heavy Construction Magazine, and U.S. Bureau of Mines.

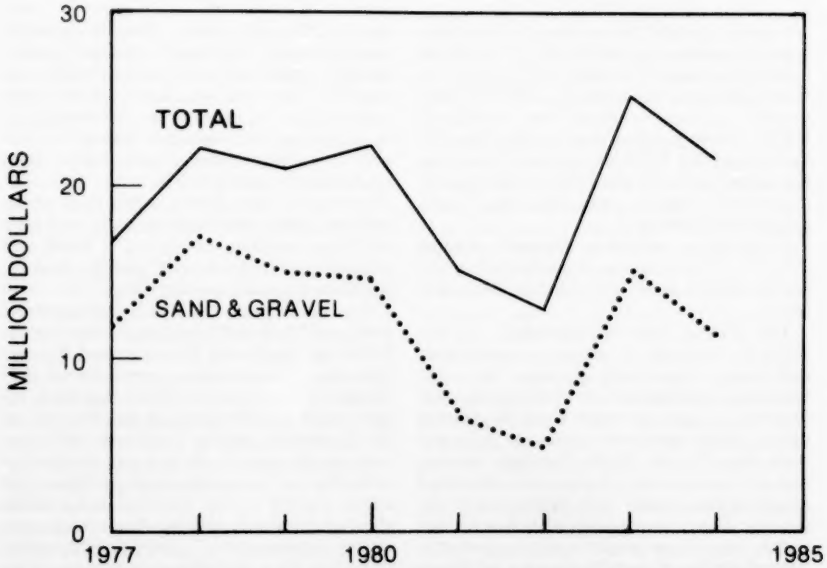

Figure 1.—Value of sand and gravel and total value of nonfuel mineral production in North Dakota.

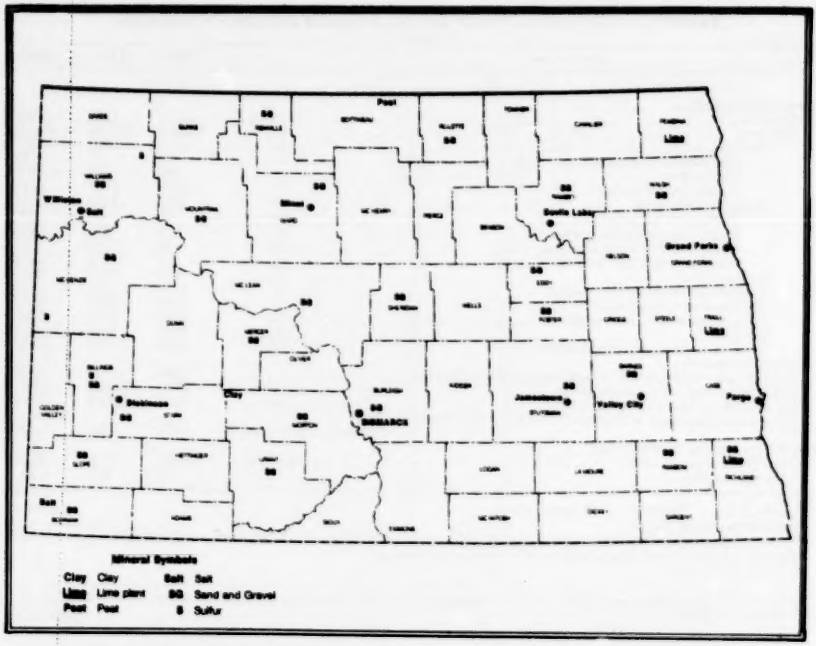

Figure 2.—Principal mineral producing localities in North Dakota.

Surface mining for minerals other than coal, as reported by the North Dakota State Soil Conservation Committee (NDSSCC), affected 462 acres, from which 3,567,697 cubic yards of mineral material was mined and 575,271 cubic yards of overburden was disturbed in 1984. NDSSCC indicated that 153 pits were operated, ranging from 0.10 to 10 acres; clay, gravel, sand, and scoria were mined from these pits.

Exploration activities, directed toward identifying occurrences of nonfuel minerals in the State, were at a standstill during 1984.

The North Dakota Geological Survey (NDGS), primarily a research organization dedicated to providing geologic input for resource development in the State, was engaged in work on more than 40 projects during 1984 designed to provide a better understanding of North Dakota's geology and mineral and water resources. Included among these projects were appraisals of the geology of various counties with five studies under way; three major mapping projects; several studies of specific geologic problems and situations that have potential to cause environmental damage; several paleontological studies of near-surface fossils with emphasis on excavation of one site and preservation of others; two paleoclimatic investigations; six detailed studies on subsurface geology, environments of deposition, depositional history, distribution, and other properties of the State's subsurface rocks; and six studies of various geologic problems with the intention of gaining a better understanding of the State's geologic history, landforms, and economic geology.

During the year, the NDGS published the results of 11 research projects, including the following: geology of Emmons and Towner Counties; ground water resources of Bottineau, Rolette, and Towner Counties; report on oil exploration and development in North Dakota during 1982 and 1983; two volumes of annual oil and gas production statistics; a new series of oil and gas field maps; reports on the environmental effect of oil and gas well drilling fluids on ground water; occurrence of mid-Paleozoic salts; and a brochure describing the geology along

North Dakota Interstate Highway 94.

North Dakota received $9.0 million as its 50% share of receipts collected on all mineral leasing rents, royalties, and bonuses collected during Federal fiscal year 1984 within the State by the Federal Government. The Federal payments were made under provisions of the Mineral Leasing Act of 1920.

Additionally, during fiscal year 1984, local governmental units within the State received $533,728 from the U.S. Department of the Interior as compensation for the loss of revenue caused by the presence of certain tax-exempt Federal lands within their boundaries. The funding, commonly referred to as "payments in lieu of taxes," was based on a formula approved by Congress in a 1976 law.

The Mining and Mineral Resources and Research Institute at the University of North Dakota, Grand Forks, was awarded a grant by the U.S. Bureau of Mines in fiscal year 1984. The grant was made to assist in the Institute's operations and research designed to encourage the training of engineers and scientists in mineral-related disciplines.

According to records maintained by the Job Service North Dakota, employment in the nonfuel minerals sector of the mining industry during 1984 averaged 420 workers, ranging from a high of 590 in August to a low of 210 during January, February, and March. These workers represented less than 1% of the total average nonagricultural work force in 1984.

REVIEW BY NONFUEL MINERAL COMMODITIES

NONMETALS

Clays.—Compared with 1983 figures, clays mined in North Dakota during 1984 increased in quantity but decreased slightly in total value. All production was obtained from two operations in Morton County.

At Hebron, Hebron Brick Co. utilized its entire output in manufacturing face brick. Near Mandan, U.S. Noonlite Ltd. manufactured lightweight aggregate from its locally mined clay. The lightweight aggregate manufactured was used principally in making building blocks and in structural concrete products.

Gem Stones.—No commercial gem stone mining was reported in the State during 1984. The value shown in this chapter is an estimate of the material that rockhounds, mineral collectors, and other hobbyists collected.

Lime.—Production of quicklime in the State during 1984 increased in quantity but decreased in value when compared with the levels attained in 1983. Two firms reported output: American Crystal Sugar Co. from plants near Drayton, Pembina County, and at Hillsboro, Traill County; and Minn-Dak Farmers Coop. at its plant near Wahpeton in Richland County. The entire output of the two firms was used in their respective sugar-refining operations at these same locations.

In 1984, approximately 114,000 short tons of lime, obtained from all domestic sources, was consumed in the State.

Peat.—In Bottineau County, a single operation producing reed-sedge peat accounted for the total State output in 1984. Marketed exclusively in bulk form, the output increased over that of 1983; however, total sales value decreased.

Salt.—Production of salt increased moderately in both quantity and value compared with the levels of 1983. The brine and evaporated salt was marketed for a variety of uses, including special salt for food processing and water softening and as a component in drilling muds. Two companies in Bowman and McKenzie Counties accounted for the brine output, and a single firm in Williams County produced evaporated material.

Sand and Gravel.—*Construction.*—Construction sand and gravel production is surveyed by the U.S. Bureau of Mines for even-numbered years only; the 1983 chapter gave estimates. Data for odd-numbered years are based on annual company estimates made before yearend.

In 1984, 114 companies and government agencies reported production of construction sand and gravel from 171 pits in 44 North Dakota counties. Output increased 69% over the estimated 1983 figure. The average value of the commodity was $1.77 per short ton, a 55% decrease from that marketed in 1983. Williams County, the leading county in production, followed by McKenzie, McLean, Walsh, and Stark Counties, collectively accounted for nearly one-third of the State output.

Approximately 94% of the construction sand and gravel produced during 1984 was shipped by truck, and the remainder was not transported.

Table 4.—North Dakota: Construction sand and gravel sold or used in 1984, by major use category

Use	Quantity (thousand short tons)	Value (thousands)	Value per ton
Concrete aggregate	95	$325	$3.44
Asphaltic concrete	16	31	1.92
Road base and coverings[1]	1,175	1,594	1.36
Fill	67	145	2.18
Snow and ice control	6	21	3.30
Railroad ballast	195	489	2.51
Other	4,872	8,746	1.80
Total or average	6,426	11,351	1.77

[1]Includes road and other stabilization (cement).

Table 5.—North Dakota: Construction sand and gravel sold or used by producers, by county

County	1982			1984		
	Number of mines	Quantity (thousand short tons	Value (thousands)	Number of mines	Quantity (thousand short tons)	Value (thousands)
Barnes	2	37	$78	6	127	$222
Benson	--	--	--	11	79	79
Bottineau	--	8	11	--	--	--
Bowman	1	W	W	3	134	232
Burleigh	2	214	525	6	W	W
Dickey	--	30	41	7	80	140
Divide	1	28	42	--	--	--
Eddy	2	W	W	3	308	597
Grand Forks	--	--	--	3	57	88
Kidder	3	31	36	3	63	98
Logan	--	--	--	1	3	12
McIntosh	--	--	--	1	5	16
McKenzie	1	189	350	5	442	738
McLean	3	118	218	14	406	533
Mercer	--	--	--	4	231	346
Morton	1	35	59	5	184	288
Mountrail	4	300	300	4	162	256
Ransom	--	--	--	3	166	290
Renville	--	--	--	3	137	227
Richland	1	40	60	4	243	605
Rolette	15	60	67	14	159	291
Stutsman	5	224	548	4	264	575
Traill	2	W	W	3	57	105
Walsh	3	71	114	7	359	682
Ward	4	W	W	3	223	391
Williams	1	29	94	15	540	906
Undistributed[1]	r14	934	2,330	39	1,998	3,632
Total[2]	65	2,347	4,873	171	6,426	11,351

rRevised. W Withheld to avoid disclosing company proprietary data; included with "Undistributed."
[1]Includes Adams (1984), Billings (1984), Burke, Cass (1982), Dunn (1984), Foster (1984), Golden Valley (1984), Grant (1984), Griggs (1984), Hettinger (1984), La Moure (1984), McHenry, Oliver (1984), Pembina (1982), Pierce, Ramsey (1984), Sargent (1984), Sheridan (1984), Sioux (1984), Slope (1984), Stark, Towner, and Wells (1982) Counties, sand and gravel that cannot be assigned to specific counties (1982), and data indicated by symbol W.
[2]Data may not add to totals shown because of independent rounding.

Sulfur (Recovered).—Elemental sulfur was recovered as a byproduct at the natural gas processing plants of five companies in Billings, McKenzie, and Williams Counties in western North Dakota, and at Amoco Oil Co.'s petroleum refinery in Mandan, Morton County. Shipments during 1984 totaled 112,000 metric tons, valued at $5,572,000, representing increases of 10% and 14%, respectively, over 1983 figures.

[1]State Mineral Officer, Bureau of Mines, Minneapolis, MN.
[2]Geologist, North Dakota Geological Survey, Grand Forks, ND.

Table 6.—Principal producers

Commodity and company	Address	Type of activity	County
Clays:			
Hebron Brick Co	Hebron, ND 58638	Pit and plant	Morton.
U.S. Noonlite Ltd	Box 117 Mandan, ND 58554	do	Do.
Lime:			
American Crystal Sugar Co	101 North 3d St. Moorhead, MN 56560	Shaft kilns at beet sugar refineries.	Pembina and Traill.
Minn-Dak Farmers Coop	Wahpeton, ND 58075	do	Richland.
Peat:			
Peat Products Co	821 4th St. Bismarck, ND 58501	Bog	Bottineau.
Salt:			
Hardy Salt Co	Drawer 449 St. Louis, MO 63166	Brine well and plant	Williams.
Koch Exploration Co	Box 2256 Wichita, KS 67201	do	Bowman.
Williams Exploration Co	3025 South Parker Rd. Suite 600 Aurora, CO 80014	do	McKenzie.
Sand and gravel (construction):			
Badinger Sand & Gravel Co	Box 306 Dickinson, ND 58601	Pits and plants	Bowman, Dunn, Eddy, Golden Valley, Grant, Sioux, Slope.
Des Lacs Sand & Gravel Co	Box 66 Des Lacs, ND 58733	do	McLean, Mountrail, Pierce, Ward, Williams.
Earth Builders Inc	Box 838 Bismark, ND 58501	do	Adams, Bowman, Ward, Williams.
Fisher Sand & Gravel Co	Box 1034 Dickinson, ND 58601	do	Bowman, Hettinger, McKenzie, McLean, Mercer, Morton, Oliver, Stark.
Holen Construction Co	Box 126 McClusky, ND 58463	do	Billings, Kidder, McKenzie, Sheridan.
Lindteigen Construction Co. Inc	Turtle Lake, ND 58575	do	Foster, Griggs, McLean, Morton.
Northern Improvement Co	Box 1254 Bismarck, ND 58501	do	Burleigh and Morton.
Schriock Construction Inc	3009 South Broadway Minot, ND 58701	do	Golden Valley, Kidder, McKenzie, Mercer, Mountrail, Renville.
Sulfur (recovered):			
Aminoil USA Inc	Box 94193 Houston, TX 77018	Plant	Williams.
Koch Hydrocarbon Co	Box 2256 Wichita, KS 67201	do	McKenzie.
Warren Petroleum Corp., a division of Gulf Oil Corp.	Box 1589 Tulsa, OK 74101	do	Billings.

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